REMARKS

Claims 37, 42-60, and 64, as amended, as well as new claims 68-75, are currently pending for the Examiner's review and consideration. Claims 37 and 42-67 were pending in this application. The Examiner has rejected claims 60-67 over various combinations of references, but had indicated the remaining claims would be allowable if amended to overcome new matter and/or indefiniteness rejections. Claims 61-63 and 65-67 have been cancelled. Claims 37 and 50 have been amended to clarify the language used to describe Applicants' invention. Claims 47 and 56 have been amended to clarify that the pH range recited is that of the oxidizing solution. Claim 60 has been amended similarly to claims 37 and 50, to clarify the language used to describe Applicants' invention, and has been amended to incorporate the subject matter of now cancelled claim 62, *i.e.*, that the nitrate comprises aluminum nitrate. Claim 64 has been amended to clarify that benzotriazole is present as a corrosion inhibitor.

New claim 68 recites the subject matter of previously presented claims 60 and 61, except that the chemical mechanical polishing composition in step (b) consists essentially of ammonium nitrate, at least one abrasive, at least one oxidizer other than ammonium nitrate, optionally at least one corrosion inhibitor, and water. Support for this new claim can be found in the originally-filed specification (*see, e.g.*, Table E_x). New claims 69-72 recite subject matter identical to that of previously presented claims 63 and 65-67, respectively, except that new claim 70 contains language similar to amended claims 47 and 56. New claim 73 recites that the second oxidizer comprises hydrazine, exemplary support for which can also be found in the originally-filed specification at Table E_x. New claims 74-75 recite the same subject matter as in amended claims 37 and 60, respectively, with more specific recitation of the planarization of the copper layer in step (a) taken *in haec verba* from the specification. In addition, the specification has been amended, as suggested by the Examiner, to include the cross-reference to the related parent application. As no new matter has been added by these amendments or new claims, Applicants respectfully request their entry at this time into the record of the above-captioned application.

The specification was objected to for not containing the issued patent number of the parent application in its cross-reference to related applications. Applicants have amended the specification to reflect the updated continuing data and thus respectfully request that the Examiner withdraw the objection.

Claims 37 and 42-67 were rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for the reasons set forth on pages 2-5 of the Office Action. The amendments to the claims, and the arguments herein, are believed to make these rejections moot, and Applicants respectfully request that these rejections be reconsidered and withdrawn.

The Examiner has indicated that the phrase "barrier/adhesion layer of Ta/TaN" in claims 37, 50, and 60 "lacks antecedent basis since ... [it] has not been **literally** defined before." (Office Action, page 2, emphasis in original). Applicants respectfully note that there is no requirement that support for a phrase be "literal" or verbatim. *See, e.g.*, M.P.E.P. § 2163.07 (citing *In re Anderson*, 471 F.2d 1267 (CCPA 1973)). However, for the sole purpose of removing any doubt as to clarity, Applicants have amended these claims to recite the phrase "barrier layer." Applicants do not consider this change to be a limiting amendment.

The Examiner has also indicated that claims 44 and 53 are indefinite, "because nitric acid is not a nitrate." (Office Action, page 3). Applicants respectfully note that nitric acid is merely hydrogen nitrate and thus is a nitrate according to the present invention. Applicants have described in the instant specification a group of nitrate-containing compounds, included in which list is nitric acid. *See* the instant specification, *e.g.*, at originally filed claim 38. The Examiner may be confused by ¶[0021] and ¶[0021] of the instant specification -- the separation of "nitric acid and/or any other inorganic acids" from "various nitrates" is not meant to imply that nitric acid is not a nitrate. Rather, the separation is functional - "nitric acid and/or any other inorganic acid" are used to lower the pH, while "various nitrates including ammonium nitrate, aluminum nitrate, or other soluble inorganic or organic nitrate salts" (emphasis added) are used to raise the pH. Claims 37 and 50 recite "a nitrate," and do not recite a nitrate salt. Applicants respectfully request that these rejections be reconsidered and withdrawn.

The Examiner has also indicated that the phrase "to planarize copper **to about the level of the barrier**" (Office Action, page 4, emphasis in original) in claims 37 and 60 is indefinite. Applicants disagree and respectfully submit that a general reading of the originally-filed specification, *e.g.*, at ¶¶ [0011]-[0014], sufficiently supports the claimed phrase. Nevertheless, while Applicants have amended claims 37 and 60 to remove that language, while new claims 74-75 were added with language taken "literally" from the specification. Applicants respectfully request that these rejections be reconsidered and withdrawn. Applicants wish to clarify that the

amendments and new claims introduced with respect to this language are made only to facilitate prosecution and not to narrow the scope of the claim language in any way, as Applicants submit that the previously recited language, while not supported "verbatim" in the specification, is nonetheless supported not only by the language of the specification (*see* M.P.E.P. § 2163.07), but also in the Background sections of the art cited by the Examiner, which details the general understanding in the art that conducting layers (such as copper) disposed over a barrier layer are typically "almost completely removed" in a first chemical mechanical polishing step (*see, e.g.*, Published U.S. Patent Application No. 2001/0008828 A1 to Uchikura *et al.*, ¶[0007]).

The Examiner has also indicated that the pH ranges recited in claims 47, 56, and 65 should more properly refer to the oxidizer pH and not to the chemical mechanical polishing composition as a whole. Applicants have amended claims 47 and 56 (as well as drafted new claim 70, which recites the subject matter of now cancelled claim 65) to comport with the Examiner's position. Applicants respectfully request that these rejections be reconsidered and withdrawn.

The remaining arguments pertain to the rejections of claims 60-67 under 35 U.S.C. §§ 102 and 103(a). Claims 60-61, 63, and 65-67 stand rejected under 35 U.S.C. §§ 102(a)/(e) and/or 103(a) as being anticipated by, or alternately obvious over, U.S. Patent No. 6,509,273 to Imai *et al.* ("Imai") and/or U.S. Patent No. 6,602,436 to Mandigo *et al.* ("Mandigo"). Applicants respectfully traverse.

First, the Examiner characterizes Imai as disclosing planarization of a barrier layer with a second composition comprising water, ammonium nitrate, benzotriazole, and silica. Applicants respectfully note that claim 60, as amended, now requires aluminum nitrate and that claims 61, 63, and 65 have been cancelled. Because Imai fails to disclose aluminum nitrate, Applicants respectfully submit that Imai does not disclose or suggest all the elements of amended claim 60, as required for an anticipation rejection. Further, Applicants respectfully submit that there is no suggestion or motivation in Imai to substitute ammonium nitrate with aluminum nitrate to achieve the invention recited in amended claim 60. Indeed, Applicants respectfully submit that Imai discloses or suggests only metal-free oxidizers, such as ammonium nitrate, and does not disclose or suggest metal-containing oxidizers, such as the instantly claimed aluminum nitrate. *See* Imai at column 15, lines 16-18. Applicants also respectfully note that Imai discloses that

hydrogen peroxide is the preferred oxidizing agent, thus teaching one of ordinary skill in the art away from the inventions recited in claims 60 and 64, as amended, as well as in new claims 68-73. *See Id.* at lines 21-24.

Applicants' new claim 68, however, which does recite an ammonium nitrate-containing composition, also requires that the composition consists essentially of ammonium nitrate, at least one abrasive, at least one oxidizer other than ammonium nitrate, optionally at least one corrosion inhibitor, and water. In contrast, Imai teaches that its polishing liquids contain both an oxidizing agent, such as ammonium nitrate, and an organic acid. *See* Imai at column 15, lines 14-21. New independent claim 68, as well as the claims depending therefrom, do not contain organic acids such as those described in Imai by virtue of the "consisting essentially of" language. Furthermore, Imai discloses polishing liquids that contain an oxidizing agent, which Applicants respectfully submit is a single oxidizing agent (*see id.*) and not a mixture of oxidizing agents, whereas new claim 73 requires the composition to contain two oxidizers, *i.e.*, ammonium nitrate and hydrazine. For at least the foregoing reasons, Applicants respectfully submit that Imai does not disclose or suggest all the elements of new claims 68-73, as required for an anticipation rejection. In addition, Applicants respectfully submit that there is no suggestion or motivation in Imai to modify the composition of the polishing liquids in Imai in such a way as to achieve the invention recited in new claims 68-73.

Second, the Examiner characterizes Mandigo as disclosing planarization of a barrier layer with a second composition comprising water, ammonium nitrate, benzotriazole, and silica. Initially, Applicants respectfully submit that Mandigo is directed to polishing an interconnect (conducting) layer, such as copper or the like, disposed over a barrier layer and an insulating layer, and not to polishing the barrier layer itself. *See* Mandigo at column 1, lines 11-15 and 44-55, Examples 1-4, and Figs. 1-3. As such, Applicants therefore respectfully submit that Mandigo's polishing compositions are inapplicable to those recited in the instant claims, as currently presented, and thus cannot anticipate or render obvious the claimed invention, as currently presented. Nevertheless, Applicants have addressed the specifics of the Mandigo teachings in detail below, for completeness.

Applicants respectfully note that claim 60, as amended, now requires aluminum nitrate and that claims 61, 63, and 65 have been cancelled. Because Mandigo fails to disclose

aluminum nitrate, Applicants respectfully submit that Mandigo does not disclose or suggest all the elements of amended claim 60, as required for an anticipation rejection. Further, Applicants respectfully submit that there is no suggestion or motivation in Mandigo to substitute ammonium nitrate with aluminum nitrate to achieve the invention recited in amended claim 60. Indeed, Applicants respectfully submit that Mandigo discloses or suggests only metal-free oxidizers, such as ammonium nitrate, and singly- or doubly- valent metal-containing oxidizers, such as potassium iodate, sodium sulfate, cesium nitrate, and barium nitrate, and not the instantly claimed aluminum nitrate. *See* Mandigo at column 4, lines 35-42. Applicants also respectfully note that Mandigo discloses that hydrogen peroxide is the preferred oxidizing agent, thus teaching one of ordinary skill in the art away from the inventions recited in claims 60 and 62, as amended, as well as in new claims 68-73. *See Id.*, lines 42-44.

Applicants' new claim 68, however, which does recite an ammonium nitrate-containing composition, also requires that the composition consists essentially of ammonium nitrate, at least one abrasive, at least one oxidizer other than ammonium nitrate, optionally at least one corrosion inhibitor, and water. In contrast, Mandigo requires that its polishing fluids further contain a polyacrylic acid and a complexing agent such as an organic acid, and allows other optional components, such as surfactants, wetting agents, etc., in its polishing fluids. *See* Mandigo at column 3, line 42 through column 5, line 4. New independent claim 68, as well as the claims depending therefrom, do not contain polyacrylic acids or complexing agents such as those described in Mandigo by virtue of the "consisting essentially of" language. Furthermore, Mandigo, while acknowledging the potential use of abrasives such as silica, teaches away from their use by preferring abrasive-free compositions. *See Id.* at column 3, lines 31-35. For at least the foregoing reasons, Applicants respectfully submit that Mandigo does not disclose or suggest all the elements of new claims 68-73, as required for an anticipation rejection. In addition, Applicants respectfully submit that there is no suggestion or motivation in Mandigo to modify the composition of the polishing fluids in Mandigo in such a way as to achieve the invention recited in new claims 68-73.

Furthermore, Mandigo does not remedy the deficiencies of Imai, such that even their combination does not disclose or suggest all the elements of the invention recited in claims 60 and 62, as amended, and new claims 68-73. For instance, neither reference discloses or suggests

the use of trivalent metal-containing oxidizing agents, such as aluminum nitrate, and both references disclose the inclusion of a complexing agent such as an organic acid.

As a result of any or all of the foregoing, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to alter or combine the teachings of Imai and/or Mandigo to achieve the invention of claims 60 and 64, as amended, and new claims 68-73. Thus, Applicants respectfully request that the aforementioned anticipation/obviousness rejection be reconsidered and withdrawn.

Claims 66-67 were rejected under 35 U.S.C. § 103(a) as being obvious over Imai or Mandigo, for the reasons set forth on page 7 of the Office Action. Applicants respectfully note that claims 66-67 were cancelled, thus rendering this rejection moot. However, as new claims 71-72 recite their respective subject matter, Applicants address this rejection below.

Applicants respectfully submit that neither Imai nor Mandigo teach the use of colloidal silica at all, nor the specific claimed particle size ranges. While the Examiner asserts that disclosure of conventional silica in general renders obvious the use of colloidal silica, Applicants strongly disagree. For one, it is well known to those of ordinary skill in the art that colloidal silica particles are considerably less abrasive to surfaces (such as semiconductor surfaces) than conventional silica abrasive grains or powders; some may desire greater polishing efficiency (faster removal rate with more abrasive materials) and tolerate more/bigger scratches), while others may. Furthermore, grains and dry powders, when simply contacted with a liquid such as water, do not typically form a colloidal suspension without considerable grinding, agitation, suspending agents, and/or pH adjustors. *See, e.g.*, the last three sentence of http://www.infoplease.com/ce6/sci/A0857435.html (a copy of which is enclosed herewith for the Examiner's convenience). Imai teaches the incorporation of dry abrasive grains/powders for barrier layer polishing (*see, e.g.*, Imai at Abstract, column 8, lines 64-65, and column 9, lines 8-11 and 61-65), while Mandigo generally teaches that abrasive-free compositions are preferred (*see, e.g.*, Mandigo at column 3, lines 31-35). As a result, Applicants respectfully submit that one of ordinary skill in the art would not have found it obvious to substitute colloidal silica for a standard abrasive powder, or even for a standard silica powder, based on the cited prior art references. Thus, Applicants respectfully request that this obviousness rejection be reconsidered and withdrawn.

Claims 62 and 64 were rejected under 35 U.S.C. § 103(a) as being obvious over either Imai or Mandigo, or both, in view of Published U.S. Patent Application No. 2001/0008828 A1 to Uchikura *et al.* ("Uchikura"), for the reasons set forth on page 8 of the Office Action. Applicants respectfully traverse.

The deficiencies of Imai and Mandigo, separately and/or in combination, have been detailed above and are not repeated here. Uchikura does not remedy these deficiencies to render the invention obvious.

The Examiner states that Uchikura teaches "in the abstract and sections [0050]-[0053] and [0102] that aluminum salts, such as nitrates (aluminum nitrate), are known oxidizers for semiconductor planarization slurries." *See* Office Action at page 8. Applicants respectfully point out that the relevant portion of Uchikura ¶[0102] reads as follows:

> A wide variety of oxidizing agents may be use, and appropriate oxidizing agents include ... iron-based ions of nitrates, sulfates, EDTA, citrates, potassium ferricyanides and the like, aluminum salts, sodium salts, potassium salts, ammonium salts, quaternary ammonium salts, phosphonium salts, or other cationic salts of peroxides, chlorates, perchlorates, nitrates, permanganates, persulfates, and mixtures thereof.

Uchikura only specifically discloses **iron-based** nitrates, and not "aluminum salts, such as nitrates," as alleged in the Office Action. Further, in the latter half of the paragraph, although Uchikura describes aluminum salts generally, as well as "other cationic salts of ... nitrates," there is no **specific** disclosure of aluminum nitrate, as alleged in the Office Action. Indeed, other than the generic disclosure of "aluminum salts," Uchikura only generally discloses nitrate salts of **other** cations (*i.e.*, presumably cations other than those already enumerated, which encompass iron, aluminum, sodium, potassium, and ammonium), and so one of ordinary skill in the art would have the entire range of known aluminum salts to sort through. To pick and choose aluminum nitrate from that list can only be done using improper hindsight, which is strictly forbidden.

At best, Uchikura discloses a long laundry list of possible oxidizers in the aforementioned paragraph, as well as possible salt cations and salt anions, but not the specific aluminum nitrate oxidizer recited in amended claim 60 (incorporating the subject matter of now-cancelled claim 62). Indeed, there are so many combinations and permutations of oxidizers taught by Uchikura

that the specific use of aluminum nitrate cannot be adequately disclosed nor anticipated by this reference. *Compare In re Petering*, 302 F.2d 676, 681-682 (CCPA 1968) and *In re Schaumann*, 572 F.2d 312, 313-314 (CCPA 1978) *with Merck & Co. v. Biocraft Laboratories, Inc.*, 874 F.2d 804, 806-807 (Fed. Cir. 1989) (holding that disclosure of a genus of over 1200 compounds is insufficient to sufficiently disclose a single species within that genus); *see also* M.P.E.P. § 2144.08 (II)(A)(4)(a).

Applicants further respectfully draw the Examiner's attention to the paragraph immediately following the laundry list of oxidizers, in which hydrogen peroxide is taught to be the preferred oxidizer. *See* Uchikura at ¶[0103]. Indeed, even in a different context, Uchikura teaches particularly preferred oxidizers to be hydrogen peroxide, persulfates such as potassium persulfate and ammonium persulfate, and inorganic acids such as nitric acid and sulfuric acid. *See Id.* at ¶[0119]. As such, even in the unlikely event that one of ordinary skill in the art would have read the disclosures of Imai and Mandigo would be motivated to search for an alternative oxidizer, for example, to ammonium nitrate, Applicants respectfully submit that they would not have picked and chosen aluminum nitrate from the plethora of oxidizers disclosed in Uchikura. No such motivation to choose such an unenumerated oxidizer exists in Uchikura, nor in Imai and/or Mandigo. Indeed, Mandigo and Uchikura **both** teach that hydrogen peroxide is the preferred oxidizer, thus *teaching away* from the selection of aluminum nitrate, as recited in amended claim 60. Thus, Applicants respectfully submit that the use of aluminum nitrate would not have been obvious to one of ordinary skill in the art, given the cited prior art references. As a result of the foregoing, Applicants respectfully request that this obviousness rejection be reconsidered and withdrawn.

Claims 60, 61, 63, and 65-66 were rejected under 35 U.S.C. §§ 102(a)/(e) and/or 103(a) as being anticipated by, or alternately obvious over, U.S. Patent No. 6,368,955 to Easter *et al.* ("Easter"), for the reasons set forth on pages 8-9 of the Office Action. Applicants respectfully traverse.

The Examiner characterizes Easter as disclosing planarization of a barrier layer with a second composition comprising water, ammonium nitrate, benzotriazole, and colloidal silica. Applicants respectfully note that claim 60, as amended, now requires aluminum nitrate and that claims 61, 63, and 65 have been cancelled. Because Easter fails to disclose aluminum nitrate,

however, Applicants respectfully submit that Easter does not disclose or suggest all the elements of amended claim 60, as required for an anticipation rejection. Further, Applicants respectfully submit that there is no suggestion or motivation in Easter to substitute ammonium nitrate with aluminum nitrate to achieve the invention recited in amended claim 60. Indeed, Applicants respectfully submit that Easter discloses or suggests ammonium salts such as ammonium nitrate and other metallic or inorganic oxidizers such as ferric nitrate, but does not disclose or suggest aluminum-containing oxidizers, such as the instantly claimed aluminum nitrate. *See* Easter at column 3, lines 45-50. Applicants also respectfully note that Easter discloses that ferric nitrate ($Fe(NO_3)_3$) is the preferred oxidizing agent, thus teaching one of ordinary skill in the art away from the inventions recited in claims 60 and 64, as amended, as well as in new claims 68-73. *See Id.* at column 7, lines 18-19. Thus, the Office Action does not provide the impetus for one of ordinary skill in the art, even if searching for additional oxidizers, to be motivated to select aluminum nitrate therefor.

Applicants' new claim 68, however, which does recite an ammonium nitrate-containing composition, also requires that the composition consists essentially of ammonium nitrate, at least one abrasive, at least one oxidizer other than ammonium nitrate, optionally at least one corrosion inhibitor, and water. In contrast, Easter discloses polishing liquids that contain an oxidizing agent, which Applicants respectfully submit is a single oxidizing agent (*see id.*) and not a mixture of oxidizing agents, whereas new claims 68-73 requires the composition to contain two oxidizers, *e.g.*, ammonium nitrate and hydrazine (*see* claim 73). For at least the foregoing reasons, Applicants respectfully submit that Easter does not disclose or suggest all the elements of new claims 68-73, as required for an anticipation rejection. In addition, Applicants respectfully submit that there is no suggestion or motivation in Easter to modify the composition of the polishing liquids in Easter in such a way as to achieve the invention recited in new claims 68-73.

As a result of any or all of the foregoing, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to selectively ignore or modify the teachings of Easter to achieve the invention of claims 60 and 64, as amended, and new claims 68-73. Thus, Applicants respectfully request that the aforementioned anticipation/obviousness rejection be reconsidered and withdrawn.

Claims 62 and 64 were rejected under 35 U.S.C. § 103(a) as being obvious over Easter, in view of Uchikura, for the reasons set forth on page 9 of the Office Action. Applicants respectfully traverse.

Applicants respectfully note that, while Easter does indeed teach that "[a]ny suitable oxidizing agent known in that art for CMP polishing can be used in the present invention" (*see* Easter at column 3, lines 45-46), Easter discloses specific examples thereof, and even teaches that ferric nitrate is preferred (*see id.* at column 7, lines 18-19). Thus, Applicants respectfully submit that Easter teaches one of ordinary skill in the art away from the use of aluminum nitrate.

Uchikura does not remedy the deficiencies of Easter. As detailed above, Uchikura discloses a vast laundry list of potential oxidizers, which, although inclusive of aluminum salts in general and of **other** nitrate salts, does not disclose or suggest aluminum nitrate specifically. Further, as Uchikura teaches a preference for hydrogen peroxide or an enumerated oxidizer other than aluminum nitrate (*see* Uchikura at ¶¶[0103] and [0119]), even the combination of Uchikura and Easter does not teach one of ordinary skill in the art to select aluminum nitrate as an oxidizer, as recited in instant claims 60 and 64, as amended.

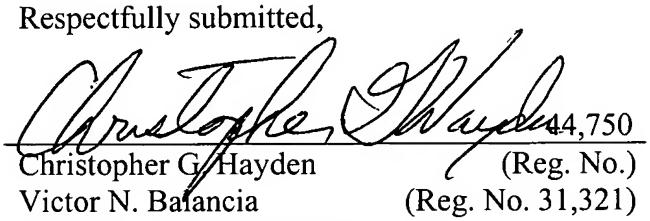
As a result of any or all of the foregoing, Applicants respectfully submit that one of ordinary skill in the art would not have been motivated to alter or combine the teachings of Easter and/or Uchikura to achieve the invention of claims 60 and 64, as amended. Thus, Applicants respectfully request that the aforementioned obviousness rejection be reconsidered and withdrawn.

Applicants respectfully submit the instant claims, as amended, are in condition for allowance. Should the Examiner disagree, it is requested that he contact the undersigned to arrange for a telephonic or in-person interview to discuss any remaining issues.

An Amendment Fee Sheet is enclosed herewith to provide for any additional fee resulting from the addition of new claims. In addition, a Petition for Extension of Time for responding to the pending Office Action is also enclosed herewith. No other fees are believed to be due for this submission. Should any additional fees be due, however, please charge such fees, and/or credit such overpayments, to Morgan, Lewis & Bockius LLP Deposit Account No. 50-0310.

Respectfully submitted,

Date: December 22, 2004



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A List of the Currently Pending Claims, As Amended 12/04

37. (Currently Amended) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, the composition comprising in aqueous solution, hydroxylamine nitrate, at least one nitrate which is not hydroxylamine nitrate, and at least one abrasive, wherein the chemical mechanical planarization composition is acidic; and

c) planarizing said barrier layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween, wherein the planarizing step results in selective planarization of the barrier layer.

38-41. (Cancelled)

42. (Previously Presented) The method of claim 37 wherein the at least one nitrate which is not hydroxylamine nitrate is ammonium nitrate.

43. (Previously Presented) The method of claim 37 wherein the at least one nitrate which is not hydroxylamine nitrate is aluminum nitrate.

44. (Previously Presented) The method of claim 37 wherein the at least one nitrate which is not hydroxylamine nitrate is nitric acid.

45. (Previously Presented) The method of claim 44 wherein the chemical mechanical planarization composition further comprises benzotriazole.

46. (Previously Presented) The method of claim 37 wherein the chemical mechanical planarization composition further comprises benzotriazole.

47. (Currently Amended) The method of claim 37 wherein the hydroxylamine nitrate and the at least one other nitrate in aqueous solution comprise an oxidizing solution, which is part of the chemical mechanical planarization composition, and wherein the oxidizing solution has a pH between about 2.1 and about 3.2.

48. (Previously Presented) The method of claim 37 wherein the abrasive comprises colloidal silica.

49. (Previously Presented) The method of claim 48 wherein the colloidal silica has a particle size range of between 20 and 150 nanometers.

50. (Currently Amended) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, the composition comprising in aqueous solution, hydrazine, at least one nitrate, and at least one abrasive; and,

c) planarizing said barrier layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween, wherein the planarizing step results in selective planarization of the barrier layer.

51. (Previously Presented) The method of claim 50 wherein the at least one nitrate is ammonium nitrate.

52. (Previously Presented) The method of claim 50 wherein the at least one nitrate aluminum nitrate.

53. (Previously Presented) The method of claim 50 wherein the at least one nitrate is nitric acid.

54. (Previously Presented) The method of claim 50 wherein the chemical mechanical planarization composition further comprises benzotriazole.

55. (Previously Presented) The method of claim 51 wherein the chemical mechanical planarization composition further comprises benzotriazole.

56. (Currently Amended) The method of claim 50 wherein the hydrazing and the at least one nitrate in aqueous solution comprise an oxidizing solution, which is part of the chemical mechanical planarization composition, wherein the oxidizing solution has a pH between about 5.7 and about 6.5.

57. (Previously Presented) The method of claim 50 wherein the abrasive comprises colloidal silica.

58. (Previously Presented) The method of claim 57 wherein the colloidal silica has a particle size range of between 20 and 150 nanometers.

59. (Previously Presented) The method of claim 50 wherein the phase one slurry to planarize the copper comprises hydrogen peroxide.

60. (Currently Amended) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier

layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, said composition comprising in aqueous solution aluminum nitrate and at least one abrasive; and,

c) planarizing said barrier/adhesion layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween.

61-63. (Cancelled)

64. (Currently Amended) The method of claim 60 wherein the chemical mechanical planarization composition further comprises a corrosion inhibitor, which comprises benzotriazole.

65-67. (Cancelled)

68. (New) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper and to stop upon reaching the barrier layer overlying a dielectric layer;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, said composition consisting essentially of a first oxidizer of ammonium nitrate, at least one abrasive, at least one second oxidizer different from the first oxidizer, optionally a corrosion inhibitor, and water; and,

c) planarizing said barrier/adhesion layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween.

69. (New) The method of claim 68, wherein the corrosion inhibitor is present and comprises benzotriazole.

70. (New) The method of claim 68, wherein the ammonium nitrate in aqueous solution comprises an oxidizing solution which is part of the chemical mechanical planarization composition, and wherein the oxidizing solution has a pH between about 5.1 and about 5.5.

71. (New) The method of claim 68, wherein the at least one abrasive comprises colloidal silica.

72. (New) The method of claim 71, wherein the colloidal silica has a particle size range of between 20 and 150 nanometers.

73. (New) The method of claim 68, wherein the second oxidizer comprises hydrazine.

74. (New) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper and to stop upon reaching the barrier layer overlying the dielectric layer;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, the composition comprising in aqueous solution, hydroxylamine nitrate, at least one nitrate which is not hydroxylamine nitrate, and at least one abrasive, wherein the chemical mechanical planarization composition is acidic; and

c) planarizing said barrier layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween, wherein the planarizing step results in selective planarization of the barrier layer.

75. (New) A method of chemical mechanical planarization of a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, comprising the steps of:

a) providing a substrate comprising a copper-containing structure, a dielectric, and a barrier layer disposed between the copper-containing structure and the dielectric, the barrier layer comprising tantalum, tantalum nitride, or both, wherein the substrate has been chemically mechanically polished with a phase one slurry to planarize the copper and to stop upon reaching the barrier layer overlying the dielectric layer;

b) providing a chemical mechanical planarization composition between the substrate and a polishing pad, said composition comprising in aqueous solution aluminum nitrate and at least one abrasive; and,

c) planarizing said barrier/adhesion layer by moving the polishing pad relative to said barrier layer while having said chemical mechanical planarization composition therebetween.